

CLAIMS:

The invention claimed is:

1. A substrate susceptor for receiving a substrate to be deposited upon, comprising:

a body having a substrate receiving side, the substrate receiving side comprising a face having a substrate receiving recess formed therein, the recess comprising an outer peripheral sidewall; and

at least three projections extending outwardly from a portion of the face, the projections respectively comprising a radially inner sidewall which extends outwardly from the recess outer peripheral sidewall to a projection upper surface.

2. The susceptor of claim 1 wherein the face portion is annular.

3. The susceptor of claim 1 wherein the face portion is substantially planar and continuous but for said projections.

4. The susceptor of claim 3 wherein the face portion is annular.

5. The susceptor of claim 1 wherein the substrate receiving recess is annular.

6. The susceptor of claim 5 wherein the face portion is annular.

7. The susceptor of claim 1 wherein the substrate receiving recess comprises a base, at least a portion of the recess outer peripheral sidewall extending perpendicularly from the recess base.

8. The susceptor of claim 7 wherein all of the recess outer peripheral sidewall extends perpendicularly from the recess base.

9. The susceptor of claim 1 wherein all said projections comprise a common shape.

10. The susceptor of claim 1 wherein said projections are each equally spaced on the face portion from immediately adjacent of said projections.

11. The susceptor of claim 1 wherein said projections are received about a circle on the face portion.

12. The susceptor of claim 11 wherein said projections collectively occupy less than 10% of the circumference of said circle.

13. The susceptor of claim 11 wherein said projections collectively occupy less than 5% of the circumference of said circle.

14. The susceptor of claim 11 wherein said projections collectively occupy less than 3% of the circumference of said circle.

15. The susceptor of claim 1 wherein said projections number no more than 8.

16. The susceptor of claim 1 wherein said projections number only 3.

17. The susceptor of claim 1 wherein said projections number only 4.

18. The susceptor of claim 1 wherein said projections number only 5.

19. The susceptor of claim 1 wherein said projections number only 6.

20. The susceptor of claim 1 wherein said projections number only 7.

21. The susceptor of claim 1 wherein said projections number only 8.

22. The susceptor of claim 1 wherein the body has an outermost peripheral edge and the projections respectively have an outmost peripheral edge, the projection outermost peripheral edge being received radially inward of the body outermost peripheral edge.

23. The susceptor of claim 1 wherein the projection upper surface is angled radially downward toward the substrate receiving recess.

24. The susceptor of claim 23 wherein the projection upper surface is angled radially downward toward the substrate receiving recess along a straight line in radial cross section.

25. The susceptor of claim 24 wherein the face portion is substantially planar but for said projections, the projection upper surface being angled at from 20° to 80° from the face portion.

26. The susceptor of claim 25 wherein the projection upper surface is angled at from 40° to 60° from the face portion.

27. The susceptor of claim 24 wherein the substrate receiving recess comprises a substantially planar base, the projection upper surface being angled at from 20° to 80° from the base.

28. The susceptor of claim 27 wherein the projection upper surface is angled at from 40° to 60° from the base.

29. The susceptor of claim 27 wherein the projection upper surface extends along a line in radial cross section having a radial extent of at least 5 mm.

30. The susceptor of claim 1 wherein the recess outer peripheral sidewall and the radially inner sidewall have a combined elevational length which is greater than thickness of a substrate for which the susceptor is designed.

31. The susceptor of claim 30 wherein the recess outer peripheral sidewall has an elevational length which is less than thickness of a substrate for which the susceptor is designed.

32. The susceptor of claim 30 wherein the recess outer peripheral sidewall has an elevational length which is equal to thickness of a substrate for which the susceptor is designed.

33. The susceptor of claim 1 wherein the recess outer peripheral sidewall and the radially inner sidewall have a combined elevational length which is equal to thickness of a substrate for which the susceptor is designed.

34. The susceptor of claim 1 wherein the recess outer peripheral sidewall and the radially inner sidewall have a combined elevational length which is less than thickness of a substrate for which the susceptor is designed.

35. The susceptor of claim 1 wherein the projection upper surface extends alone a straight line in radial cross section.

36. The susceptor of claim 1 wherein the projection upper surface comprises a curved portion in radial cross section.

37. The method of claim 1 wherein the projection upper surface has an uppermost elevation which is received higher than an uppermost surface of a substrate for which the susceptor is designed when said substrate is received by said recess.

38. The method of claim 1 wherein the projection upper surface has an uppermost elevation which is received elevationally coincident with an uppermost surface of a substrate for which the susceptor is designed when said substrate is received by said recess.

39. The method of claim 1 wherein the projection upper surface has an uppermost elevation which is received elevationally lower than an uppermost surface of a substrate for which the susceptor is designed when said substrate is received by said recess.

40. The susceptor of claim 1 wherein at least a portion of the outer peripheral sidewall is angled radially downward toward the substrate receiving recess.

41. The susceptor of claim 40 wherein the substrate receiving recess comprises a base, a first portion of the recess outer peripheral sidewall extending perpendicularly relative to the recess base, a second portion of the recess outer peripheral sidewall extending from the first portion and being angled radially downward toward the substrate receiving recess.

42. The susceptor of claim 41 wherein the second portion extends along a line in radial cross section having a radial extent of at least 5 mm.

43. The method of claim 1 wherein the projection upper surface has an uppermost elevation which is received elevationally coincident with an uppermost surface of a substrate for which the susceptor is designed when said substrate is received by said recess.

44. The susceptor of claim 1 wherein the body has an outermost peripheral edge, the face spanning completely and continuously across the body within confines of the outermost peripheral edge.

45. A substrate susceptor for receiving a substrate to be deposited upon, comprising:

a body having a substrate receiving side, the substrate receiving side comprising a face having a substrate receiving recess formed therein, the recess comprising a base and an outer peripheral sidewall at least a portion of which extends perpendicularly therefrom; and

at least three projections extending outwardly from a portion of the face, the projections respectively comprising a radially inner sidewall which extends outwardly from the recess outer peripheral sidewall to a projection upper surface, the projection upper surface being angled radially downward toward the substrate receiving recess, the recess outer peripheral sidewall and the radially inner sidewall have a combined elevational length which is at least as great as thickness of a substrate for which the susceptor is designed.

46. The susceptor of claim 45 wherein the recess outer peripheral sidewall and the radially inner sidewall have a combined elevational length which is equal to thickness of a substrate for which the susceptor is designed.



47. The susceptor of claim 45 wherein the recess outer peripheral sidewall and the radially inner sidewall have a combined elevational length which is greater than thickness of a substrate for which the susceptor is designed.

48. The susceptor of claim 45 wherein the base is substantially planar, the projection upper surface being angled along a straight line in radial cross section at from 20° to 80° from the base.

49. The susceptor of claim 48 wherein the projection upper surface is angled along a straight line in radial cross section at from 40° to 60° from the base.

50. The susceptor of claim 45 wherein the face portion is substantially planar but for said projections, the projection upper surface being angled along a straight line in radial cross section at from 20° to 80° from the face portion.

51. The susceptor of claim 50 wherein the projection upper surface is angled along a straight line in radial cross section at from 40° to 60° from the face portion.

52. The susceptor of claim 45 wherein all of the recess outer peripheral sidewall extends perpendicularly from the recess base.

53. The susceptor of claim 45 wherein all said projections comprise a common shape.

54. The susceptor of claim 45 wherein said projections are each equally spaced on the face portion from immediately adjacent of said projections.

55. The susceptor of claim 45 wherein said projections are received about a circle on the face portion.

56. The susceptor of claim 55 wherein said projections collectively occupy less than 10% of the circumference of said circle.

57. The susceptor of claim 55 wherein said projections collectively occupy less than 5% of the circumference of said circle.

58. The susceptor of claim 55 wherein said projections collectively occupy less than 3% of the circumference of said circle.

59. The susceptor of claim 45 wherein said projections number no more than 8.

60. The susceptor of claim 45 wherein said projections number only 3.

61. The susceptor of claim 45 wherein said projections number only 4.

62. The susceptor of claim 45 wherein said projections number only 5.

63. The susceptor of claim 45 wherein said projections number only 6.

64. The susceptor of claim 45 wherein said projections number only 7.

65. The susceptor of claim 45 wherein said projections number only 8.

66. The susceptor of claim 45 wherein the body has an outermost peripheral edge and the projections respectively have an outmost peripheral edge, the projection outermost peripheral edge being received radially inward of the body outermost peripheral edge.

67. The susceptor of claim 45 wherein the projection upper surface extends along a line in radial cross section having a radial extent of at least 5 mm.

68. A substrate susceptor for receiving a substrate to be deposited upon, comprising:

a body having a substrate receiving side, the substrate receiving side comprising a face; and

at least three projections extending outwardly from a portion of the face, the projections respectively comprising a radially inner substrate retaining sidewall which extends outwardly to a projection upper surface.

69. A substrate susceptor for receiving a substrate to be deposited upon by thermal deposition comprising back side radiant heating of the susceptor, the susceptor comprising:

a body having a front substrate receiving side and a back side, the front and back sides respectively comprising a face, the front side face having an inner area face over which the substrate to be deposited upon is to be received, the back side face comprising at least one radiation emission-lowering recess received opposite a portion of the front side inner area face over which the substrate to be deposited upon is to be received.

70. The susceptor of claim 69 wherein the at least one radiation emission-lowering recess comprises an annular groove.

71. The susceptor of claim 69 comprising a plurality of said radiation emission-lowering recesses.

72. The susceptor of claim 71 wherein the plurality have a common shape.

73. The susceptor of claim 71 wherein the radiation emission-lowering recesses comprise annular grooves.

74. The susceptor of claim 71 wherein the radiation emission-lowering recesses comprise commonly shaped annular grooves.

75. The susceptor of claim 69 wherein the at least one radiation emission-lowering recess is square in cross section.

76. The susceptor of claim 69 wherein the at least one radiation emission-lowering recess is rectangular in cross section.

77. The susceptor of claim 69 wherein the at least one radiation emission-lowering recess is triangular in cross section.

78. The susceptor of claim 69 wherein the at least one radiation emission-lowering recess includes a curved portion in cross section.

79. The susceptor of claim 78 wherein the at least one radiation emission-lowering recess is half spherical in cross section.

80. The susceptor of claim 69 comprising a plurality of discrete of said radiation emission-lowering recesses formed about an annulus.

81. The susceptor of claim 80 wherein at least some of the plurality of radiation emission-lowering recesses are half spherical in cross section.

82. The susceptor of claim 69 wherein the back side face is substantially planar but for said at least one radiation emission-lowering recess.

83. The susceptor of claim 69 wherein the body has a minimum thickness within the inner area face over which the substrate to be deposited upon is to be received but for said at least one radiation emission-lowering recess, the at least one radiation emission-lowering recess having a depth which is more than half of said minimum thickness.

84. The susceptor of claim 83 wherein the body has constant thickness within at least a majority of the inner area face over which the substrate to be deposited upon is to be received but for said at least one radiation emission-lowering recess.

85. The susceptor of claim 69 wherein the inner area face is defined such that the substrate to be deposited upon extends laterally outside the inner area face.

86. The susceptor of claim 85 wherein the body has constant thickness within all of the inner area face over which the substrate to be deposited upon is to be received but for said at least one radiation emission-lowering recess.

87. The susceptor of claim 69 wherein the substrate susceptor is adapted for receiving a substrate to be deposited upon by thermal deposition comprising back side radiant heating from at least two back side radiation emitting sources which form an overlapped area of back side incident radiation, the at least one radiation emission-lowering recess being received within the overlapped area.

88. The susceptor of claim 69 wherein the front side comprises a substrate receiving recess.

89. A substrate susceptor for receiving a substrate to be deposited upon by thermal deposition comprising back side radiant heating of the susceptor from at least two back side radiation emitting sources which form an overlapped area of back side incident radiation, the susceptor comprising:

a body having a front substrate receiving side and a back side, the front and back sides respectively comprising a face, the front side face having an inner area face over which the substrate to be deposited upon is to be received, the back side face comprising multiple radiation emission-lowering recesses received opposite a portion of the front side inner area face over which the substrate to be deposited upon is to be received and received within the overlapped area.

90. The susceptor of claim 89 wherein the multiple radiation emission-lowering recesses have a common shape.

91. The susceptor of claim 89 wherein the multiple radiation emission-lowering recesses comprise annular grooves.

92. The susceptor of claim 89 wherein the multiple radiation emission-lowering recesses comprise commonly shaped annular grooves.

93. The susceptor of claim 89 wherein the multiple radiation emission-lowering recesses are square in cross section.



94. The susceptor of claim 89 wherein the multiple radiation emission-lowering recesses are rectangular in cross section.

95. The susceptor of claim 89 wherein the multiple radiation emission-lowering recesses are triangular in cross section.

96. The susceptor of claim 89 wherein the multiple radiation emission-lowering recesses include a curved portion in cross section.

97. The susceptor of claim 96 wherein at least some of the multiple radiation emission-lowering recesses are half spherical in cross section.

98. The susceptor of claim 89 comprising a plurality of discrete of said radiation emission-lowering recesses formed about an annulus.

99. The susceptor of claim 98 wherein at least some of the multiple radiation emission-lowering recesses are half spherical in cross section.

100. The susceptor of claim 89 wherein the back side face is substantially planar but for said multiple radiation emission-lowering recesses.

101. The susceptor of claim 89 wherein the body has a minimum thickness within the inner area face over which the substrate to be deposited upon is to be received but for said at least one radiation emission-lowering recess, the respective multiple radiation emission-lowering recesses having a depth which is more than half of said minimum thickness.

102. The susceptor of claim 101 wherein the body has constant thickness within at least a majority of the inner area face over which the substrate to be deposited upon is to be received but for said at least one radiation emission-lowering recess.

103. The susceptor of claim 89 wherein the inner area face is defined such that the substrate to be deposited upon extends laterally outside the inner area face.

104. The susceptor of claim 103 wherein the body has constant thickness within all of the inner area face over which the substrate to be deposited upon is to be received but for said at least one radiation emission-lowering recess.

105. A substrate susceptor for receiving a substrate to be deposited upon by thermal deposition comprising susceptor heating, the susceptor comprising:

a body having a front substrate receiving side and a back side, the front side having an inner area and a peripheral area received about the inner area, the front side comprising an inner area face received within and smaller than the inner area, the inner area face having a central region and a peripheral region received about the central region, the front side inner area having a peripheral surface configured to at least in part support a substrate to be deposited upon proximate a periphery of said substrate to space said substrate from a portion of the front side inner area face, the front side inner area face comprising at least one central region projection extending to contact the substrate to be deposited upon.

106. The susceptor of claim 105 wherein the at least one central region projection comprises a solid cylinder.

107. The susceptor of claim 106 wherein the at least one central region projection comprises multiple solid cylinders.

108. The susceptor of claim 106 wherein the at least one central region projection comprises only a single solid cylinder.

109. The susceptor of claim 108 wherein the single solid cylinder is centered within the central region.

110. The susceptor of claim 109 wherein the single solid cylinder has a radius of at least 10 mm.

111. The susceptor of claim 109 wherein the single solid cylinder has a radius of at least 30 mm.

112. The susceptor of claim 109 wherein the single solid cylinder has a radius of from 25% to 33% of radius of said substrate to be deposited upon.

113. The susceptor of claim 105 wherein the at least one central region projection comprises a ring.

114. The susceptor of claim 113 wherein the ring is concentric about a center of the central region.

115. The susceptor of claim 105 wherein the at least one central region projection comprises multiple rings.

116. The susceptor of claim 115 wherein the multiple rings are concentric about a center of the central region.

117. The susceptor of claim 116 wherein the multiple rings collectively occupy a radius of at least 10 mm.

118. The susceptor of claim 116 wherein the multiple rings collectively occupy a radius of at least 30 mm.

119. The susceptor of claim 116 wherein the multiple rings collectively occupy a radius of from 25% to 33% of radius of said substrate to be deposited upon.

120. The susceptor of claim 105 wherein the front side inner area face comprises multiple central region projections extending to contact the substrate to be deposited upon.

121. The susceptor of claim 120 wherein the at least one central region projection comprises a solid cylinder and at least one ring received thereabout.

122. The susceptor of claim 121 wherein the at least one central region projection comprises a solid cylinder and only a single ring received thereabout.

123. The susceptor of claim 121 wherein the at least one central region projection comprises a solid cylinder and multiple rings received thereabout.

124. The susceptor of claim 123 wherein the at least one central region projection comprises a solid cylinder and only two rings received thereabout.

125. The susceptor of claim 105 wherein the at least one central region projection is effective to raise average temperature of a portion of said substrate overlying the central region during deposition upon said substrate than would otherwise occur under identical conditions in the absence of the at least one central region projection.

126. The susceptor of claim 105 being adapted for receiving a substrate to be deposited upon by thermal deposition which creates a first region of said substrate when overlying the central region of the inner area face to have an average temperature which is lower than a second region of said substrate immediately surrounding the first region, with the central region projection increasing the first region average temperature compared to the second region average temperature than would otherwise occur under identical conditions in the absence of the at least one central region projection.

127. The susceptor of claim 105 wherein the peripheral surface is continuous and planar about a circle.

128. The susceptor of claim 105 wherein the peripheral surface extends radially inward with at least a 20 mm radial length of the peripheral surface being positioned to contact the substrate to be deposited upon.

129. The susceptor of claim 105 wherein the front side inner area face comprises a plurality of projections within the inner area face peripheral region extending to contact the substrate to be deposited upon.

130. The susceptor of claim 129 wherein the plurality of peripheral region projections comprise rings..

131. The susceptor of claim 130 wherein the rings are of constant width.

132. The susceptor of claim 130 wherein the rings are of at least two different widths.

133. The susceptor of claim 130 wherein the rings are concentric about a center of the central region.

134. The susceptor of claim 105 wherein the front side face comprises a substrate receiving recess comprising the peripheral surface.

135. A substrate susceptor for receiving a substrate to be deposited upon by thermal deposition comprising susceptor heating, the susceptor comprising:

a body having a front substrate receiving side and a back side, the front side having an inner area and a peripheral area received about the inner area, the front side comprising an inner area face received within and smaller than the inner area, the inner area face having a central region and a peripheral region received about the central region, the front side inner area having a peripheral surface configured to at least in part support a substrate to be deposited upon proximate a periphery of said substrate to space said substrate from a portion of the front side inner area face, the peripheral surface extending radially inward with at least a 20 mm radial length of the peripheral surface being positioned to contact a substrate to be deposited upon.

136. The susceptor of claim 135 wherein at least a 25 mm radial length of the peripheral surface is positioned to contact the substrate to be deposited upon.



137. The susceptor of claim 135 wherein at least a 30 mm radial length of the peripheral surface is positioned to contact the substrate to be deposited upon.

138. The susceptor of claim 135 wherein at least a 35 mm radial length of the peripheral surface is positioned to contact the substrate to be deposited upon.

139. The susceptor of claim 135 wherein the peripheral surface extends radially inward with at least a radial length of from 25% to 33% of radius of said substrate to be deposited upon of the peripheral surface being positioned to contact the substrate to be deposited upon.

140. A substrate susceptor for receiving a substrate to be deposited upon by thermal deposition comprising susceptor heating, the susceptor comprising:

a body having a front substrate receiving side and a back side, the front side having an inner area and a peripheral area received about the inner area, the front side comprising an inner area face received within and smaller than the inner area, the inner area face having a central region and a peripheral region received about the central region, the front side inner area having a peripheral surface configured to at least in part support a substrate to be deposited upon proximate a periphery of said substrate to space said substrate from a portion of the front side inner area face; and

the front side inner area face comprising a plurality of projections within the inner area face peripheral region extending to contact the substrate to be deposited upon.

141. The susceptor of claim 140 wherein the plurality of peripheral region projections comprise rings.

142. The susceptor of claim 141 wherein the rings are of constant width.

143. The susceptor of claim 141 wherein the rings are of at least two different widths.

144. The susceptor of claim 141 wherein the rings are concentric about a center of the central region.

145. The susceptor of claim 144 wherein the rings are of constant width.

146. The susceptor of claim 140 wherein the plurality of inner area face projections comprise multiple solid cylinders.

147. The susceptor of claim 140 wherein the front side inner area face comprises a central region ring projection extending to contact the substrate to be deposited upon.

148. The susceptor of claim 147 wherein the ring is concentric about a center of the central region.

149. The susceptor of claim 140 wherein the front side inner area face comprises multiple central region projections extending to contact the substrate to be deposited upon.

150. The susceptor of claim 149 wherein the multiple central region projections comprise a solid cylinder and at least one ring received thereabout.

151. The susceptor of claim 150 wherein the multiple central region projections comprise a solid cylinder and only a single ring received thereabout.

152. The susceptor of claim 150 wherein the multiple central region projections comprise a solid cylinder and multiple rings received thereabout.

153. The susceptor of claim 152 wherein the at least one central region projection comprises a solid cylinder and only two rings received thereabout.